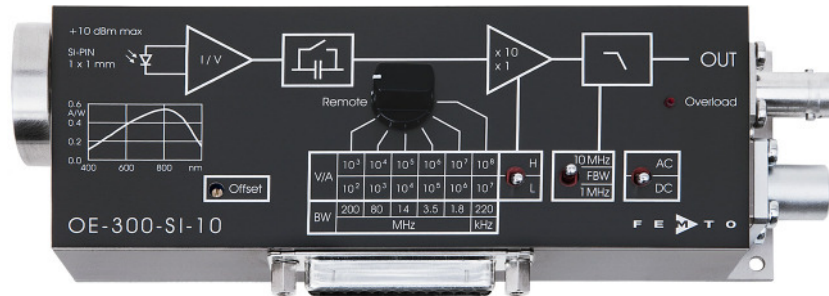


## 200 MHz Variable Gain Photoreceiver



The image shows model OE-300-Si-10-FST with 1.035"-40 threaded flange and coupler ring.

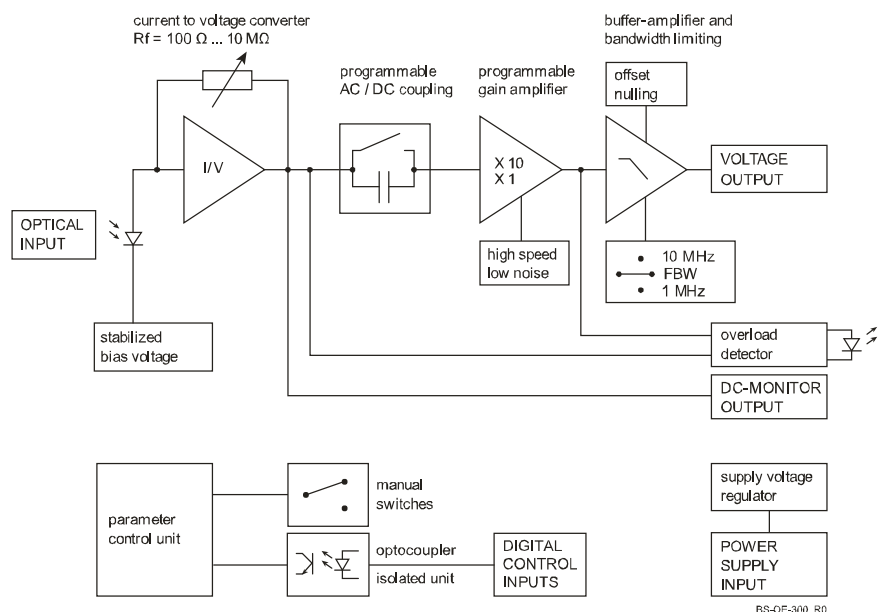
Features

- Adjustable transimpedance gain from  $10^2$  to  $10^8$  V/A
- Wide bandwidth up to 200 MHz
- Si-PIN photodiode covering the 400 to 1,000 nm wavelength range
- Large optical detector size 1 x 1 mm
- High dynamic input range up to 10 mW optical power
- Very low noise, NEP down to 140 fW/√Hz
- Switchable low pass filters for minimizing wideband noise
- Threaded 1.035"-40 and unthreaded 25 mm dia. free space input available, compatible with many optical standard accessories
- 1.035"-40 input easily convertible to fiber optic input with optional adapter
- Full manual and remote control capability

Applications

- All purpose low-noise photoreceiver (O/E converter) for the MHz range
- Time resolved optical pulse and power measurements
- Laser intensity noise measurements (RIN)
- Optical front-end for oscilloscopes, spectrum analyzers, A/D converters and RF lock-in amplifiers

Block Diagram



## 200 MHz Variable Gain Photoreceiver

Available Versions

OE-300-SI-10-FST

1.035"-40 threaded flange  
for free space applications and for use with various types  
of fiber connector adapters

OE-300-SI-10-FS

25 mm dia. unthreaded flange  
for free space applications

1.035"-40 threaded flange  
Internal threaded coupler ring  
(included)  
Fiber-adapter PRA-FC  
(optional)



OE-300-SI-10-FST

Related OE-300 Models

See separate datasheets for following models on [www.femto.de](http://www.femto.de):

OE-300-SI-30-FST

Si-PIN,  $\varnothing$  3 mm, 320 - 1000 nm  
1.035"-40 threaded flange

OE-300-SI-30-FS

Si-PIN,  $\varnothing$  3 mm, 320 - 1000 nm  
25 mm dia. unthreaded flange

OE-300-IN-01-FC

InGaAs-PIN,  $\varnothing$  80  $\mu$ m, 900 - 1700 nm  
FC fiber receptacle only

OE-300-IN-03-FST

InGaAs-PIN,  $\varnothing$  300  $\mu$ m, 800 - 1700 nm  
1.035"-40 threaded flange

OE-300-IN-03-FS

InGaAs-PIN,  $\varnothing$  300  $\mu$ m, 800 - 1700 nm  
25 mm dia. unthreaded flange

OE-300-S

customized versions available on request

Available Accessories

PRA-FC (picture)  
PRA-FSMA



fiber-adapter with external  
1.035"-40 thread

PRA-PAP



post adapter plate,  
easy to mount on  
FEMTO photoreceiver series  
OE, FWPR, HCA-S and LCA-S

PS-15

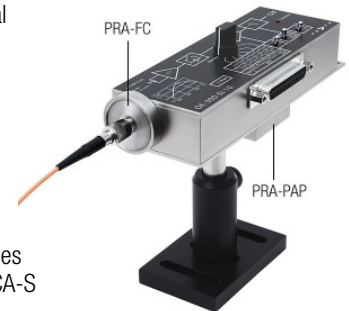


power supply,  
input: 100 - 240 VAC,  
output:  $\pm$ 15 VDC, +400/-250 mA

LUCI-10



compact digital I/O interface for USB remote control,  
supports opto-isolation of amplifier signal path from PC  
USB port, 16 digital outputs, 3 opto-isolated digital inputs,  
bus-powered operation



**200 MHz Variable Gain Photoreceiver**

Specifications	Test conditions	$V_s = \pm 15\text{ V}$ , $T_A = 25\text{ }^\circ\text{C}$ , system impedance = $50\ \Omega$
Gain	Transimpedance gain	$1 \times 10^2 \dots 1 \times 10^8\ \text{V/A}$
	Gain accuracy	$\pm 1\ \%$
Frequency Response	Lower cut-off frequency	DC/100 Hz, switchable
	Upper cut-off frequency	up to 200 MHz (see table below), switchable to 1 MHz or 10 MHz
Input	Noise equivalent power (NEP)	see table below
	Max. CW saturation power	see table below
Detector	Detector	Si-PIN photodiode
	Active area	1 mm x 1 mm (1 mm <sup>2</sup> )
	Spectral response	400 - 1050 nm
	Sensitivity R	0.58 A/W typ. @ 850 nm
	Dark current	0.12 nA typ.

Performance Depending on Gain Setting	Gain setting (low noise) (V/A)	$10^2$	$10^3$	$10^4$	$10^5$	$10^6$	$10^7$
	Upper cut-off frequency (-3 dB)	200 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
	Rise/fall time (10 % - 90 %)	1.8 ns	4.4 ns	25 ns	0.1 $\mu\text{s}$	0.2 $\mu\text{s}$	1.6 $\mu\text{s}$
	NEP ( $\sqrt{\text{Hz}}$ , @ 850 nm)	377 pW	31 pW	10 pW	2.9 pW	537 fW	153 fW
	Measured at	20 MHz	8 MHz	1.4 MHz	350 kHz	180 kHz	22 kHz
	Integrated input noise (rms)*	7.5 $\mu\text{W}$	580 nW	35 nW	4.9 nW	1.3 nW	100 pW
	CW saturation power (@ 850 nm)	10 mW	1.7 mW	170 $\mu\text{W}$	17 $\mu\text{W}$	1.7 $\mu\text{W}$	170 nW
	Gain setting (high speed) (V/A)	$10^3$	$10^4$	$10^5$	$10^6$	$10^7$	$10^8$
	Upper cut-off frequency (-3 dB)	175 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
	Rise/fall time (10 % - 90 %)	2 ns	4.4 ns	25 ns	0.1 $\mu\text{s}$	0.2 $\mu\text{s}$	1.6 $\mu\text{s}$
	NEP ( $\sqrt{\text{Hz}}$ , @ 850 nm)	249 pW	11 pW	2.9 pW	858 fW	522 fW	140 fW
	Measured at	18 MHz	8 MHz	1.4 MHz	350 kHz	180 kHz	22 kHz
	Integrated input noise (rms)*	4.5 $\mu\text{W}$	440 nW	31 nW	4.8 nW	1.3 nW	100 pW
	CW saturation power (@ 850 nm)	1.7 mW	170 $\mu\text{W}$	17 $\mu\text{W}$	1.7 $\mu\text{W}$	170 nW	17 nW

\* The integrated input noise is measured with a shaded input in the full bandwidth ("FBW") setting (referred to 850 nm). The measurement bandwidth is 3 x the upper cut-off frequency at the specific gain setting; filter slope is a 1<sup>st</sup> order roll-off.

The input referred peak-peak noise can be calculated from the rms noise as follows:

$$P_{\text{Input noise peak-to-peak}} = P_{\text{Input noise rms}} \times 6$$

The output noise is given by:

$$U_{\text{Output noise rms}} = P_{\text{Input noise rms}} \times \text{gain} \times R$$

$$U_{\text{Output noise peak-to-peak}} = U_{\text{Output noise rms}} \times 6 = P_{\text{Input noise rms}} \times \text{gain} \times R \times 6$$

The integrated noise will be reduced considerably by setting the low pass filter to "1 MHz" or "10 MHz" instead of "FBW". This is especially useful for continuous wave (CW) measurements.

**200 MHz Variable Gain Photoreceiver**

Specifications (continued)

Output	Output voltage range	±1 V (@ 50 Ω load), for linear amplification	
	Output impedance	50 Ω (designed for 50 Ω load)	
	Slew rate	1,000 V/μs	
	Max. output current	±40 mA	
Ext. Offset Control	Output offset compensation	adjustable by offset potentiometer and external control voltage, output offset compensation range min. ±100 mV	
	Control voltage range	±10 V	
Indicator LED	Offset control input impedance	15 kΩ	
	Function	overload	
Digital Control	Control input voltage range	LOW bit: -0.8 ... +1.2 V, HIGH bit: +2.3 ... +12 V	
	Control input current	0 mA @ 0 V, 1.5 mA @ +5 V, 4.5 mA @ +12 V	
	Overload output	non active: <0.4 V @ 0 ... -1 mA	
		active: typ. 5 ... 5.1 V @ 0 ... 2 mA	
Power Supply	Supply voltage	±15 V	
	Supply current	+110/-90 mA (depends on operating conditions, recommended power supply capability min ±200 mA)	
	Stabilized power supply output	±12 V, max. 20 mA, +5 V, max. 150 mA	
Case	Weight	320 g (0.74 lb.)	
	Material	AlMg4.5Mn, nickel-plated	
Input Flange	Material	1.4301 stainless steel, glass bead blasted (1.035"-40 threaded flange)	
		AlMg4.5Mn, nickel-plated (25 mm dia. unthreaded flange)	
Coupler Ring	Material	1.4301 stainless steel, glass bead blasted	
DC Monitor Output	Monitor output gain	Mode	Monitor gain
		Low noise	Gain setting divided by -1
	High speed	Gain setting divided by -10	
	Monitor output polarity	inverting	
	Monitor output voltage range	±1 V (@ ≥1 MΩ load)	
	Monitor output bandwidth	DC ... 1 kHz	
	Monitor output impedance	1 kΩ (designed for ≥1 MΩ load)	
Temperature Range	Storage temperature	-40 ... +80 °C	
	Operating temperature	0 ... +60 °C	
Absolute Maximum Ratings	Max. CW power (averaged)	12 mW	
	Digital control input voltage	-5 V/+16 V relative to digital ground DGND (pin 9)	
	Analog control input voltage	±15 V relative to analog ground AGND (pin 3)	
	Power supply voltage	±20 V	

**200 MHz Variable Gain Photoreceiver**

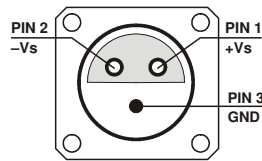
Connectors

Input OE-300-SI-10-FST 1.035"-40 threaded flange for free space applications and for use with various types of fiber connector adapters

OE-300-SI-10-FS 25 mm unthreaded round flange for free space applications

Output BNC jack (female)

Power supply Lemo® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)  
 Pin 1: +15 V  
 Pin 2: -15 V  
 Pin 3: GND



Control port Sub-D 25-pin, female, qual. class 2

Pin 1: +12 V (stabilized power supply output)  
 Pin 2: -12 V (stabilized power supply output)  
 Pin 3: AGND (analog ground for pins 1 - 8)  
 Pin 4: +5 V (stabilized power supply output)  
 Pin 5: digital output: overload (referred to pin 3)  
 Pin 6: DC Monitor output  
 Pin 7: NC (= not connected)  
 Pin 8: output offset control voltage input  
 Pin 9: DGND (ground for digital control pins 10 - 14)  
 Pin 10: digital control input: gain, LSB  
 Pin 11: digital control input: gain  
 Pin 12: digital control input: gain, MSB  
 Pin 13: digital control input: AC/DC  
 Pin 14: digital control input: high speed / low noise  
 Pin 15: upper cut-off frequency limit 10 MHz  
 Pin 16: upper cut-off frequency limit 1 MHz  
 Pin 17 - 25: NC (= not connected)

Scope of Delivery

OE-300-SI-10, threaded coupler ring ("FST" version only), Lemo® 3-pin connector, datasheet, transport package

## 200 MHz Variable Gain Photoreceiver

Remote Control Operation

General

Remote control input bits are opto-isolated and connected by a logical OR function to the local switch settings. For remote control set the corresponding local switches to "Remote", "AC" and "H" and select the desired setting via a bit code at the corresponding digital inputs. Mixed operation, e.g. local AC/DC setting and remote controlled gain setting, is also possible.

Gain setting

Low noise Gain (V/A) Pin 14=HIGH	High speed Gain (V/A) Pin 14=LOW	Pin 12 MSB	Pin 11	Pin 10 LSB
$10^2$	$10^3$	LOW	LOW	LOW
$10^3$	$10^4$	LOW	LOW	HIGH
$10^4$	$10^5$	LOW	HIGH	LOW
$10^5$	$10^6$	LOW	HIGH	HIGH
$10^6$	$10^7$	HIGH	LOW	LOW
$10^7$	$10^8$	HIGH	LOW	HIGH

AC/DC setting

Coupling	Pin 13
DC	LOW
AC	HIGH

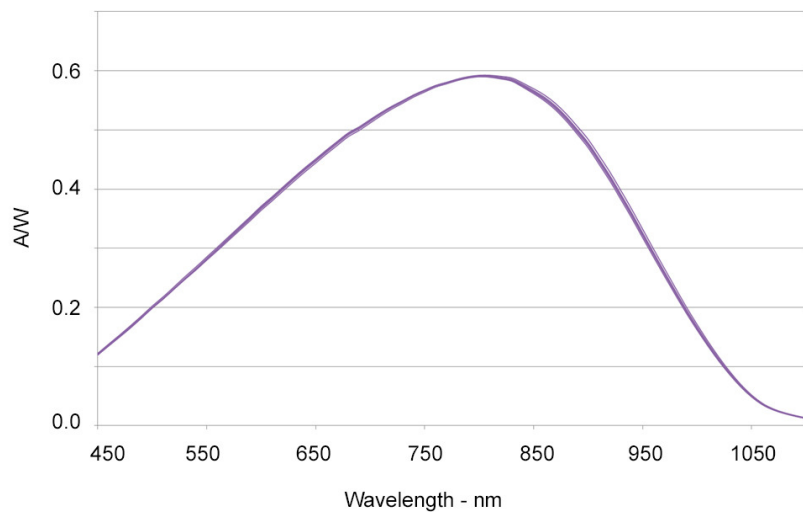
Low pass filter setting

Upper cut-off frequ. limit	Pin 15	Pin 16
full bandwidth	LOW	LOW
10 MHz	HIGH	LOW
1 MHz	LOW	HIGH

High speed / low noise setting

Mode	Pin 14
low noise mode	LOW
high speed mode	HIGH

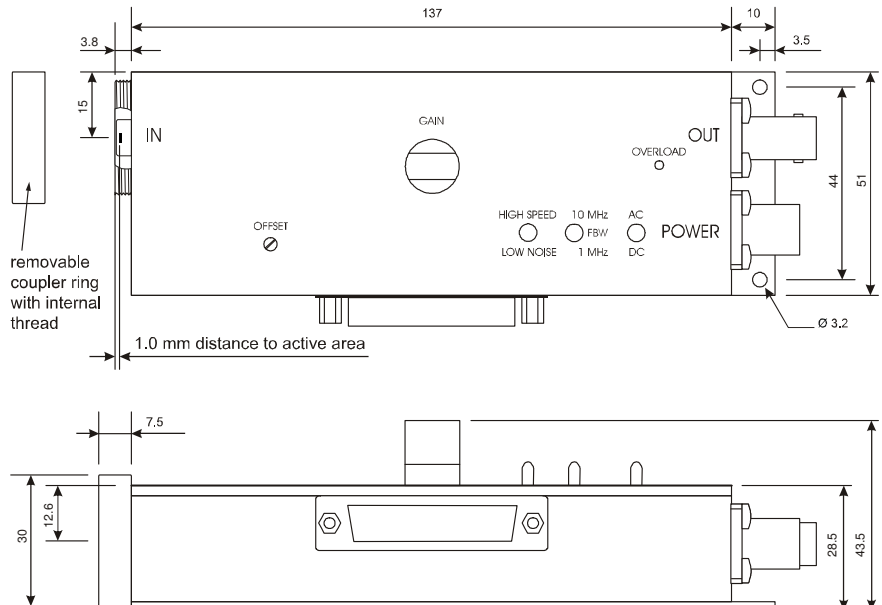
Spectral Responsivity



200 MHz Variable Gain Photoreceiver

Dimensions

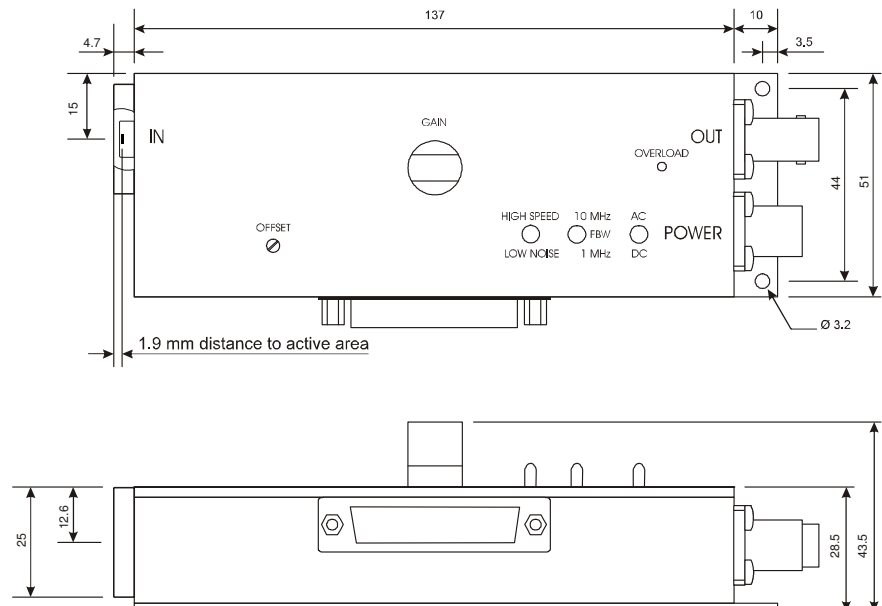
Threaded free space input OE-300-SI-10-FST:



All measurements in mm unless otherwise noted.

DZ-OE-300-FST\_R1

Free space input OE-300-SI-10-FS:



All measurements in mm unless otherwise noted.

DZ-OE-300-FS\_R1

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